Science Attitude and Science Anxiety on the Academic Performance of Grade 10 Learners

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ABSTRACT

This study examines the relationship between science attitude and science anxiety on the academic performance of Grade 10 students in the Division of Panabo City. This study employs a quantitative correlational research design to investigate the relationship between learners' psychological factors and their academic performance in science. Descriptive statistics indicated that learners exhibited a high level of science attitude (M = 3.49, SD = 1.01, "High") and a low level of science anxiety (M = 2.55, SD = 1.15, "Low"), while their science academic performance was satisfactory (M = 84.02, SD = 5.19, "Satisfactory"). The results of the Pearson correlation indicated a significant positive relationship between science attitude and academic performance (r = 0.358**, p < .000), whereas science anxiety exhibited a significant negative correlation (r = –0.305, p < .000). The analysis using multiple regression indicated that science attitude B = 2.935 (t= 6.061, p < .001) and science anxiety (B = -1.871, t = -4.624, p < .001) emerged as significant predictors of academic performance in science, explaining 17.7% of the variance (R² = 0.177). The results highlight the significance of fostering emotional support to inculcate positive attitudes towards science and reducing science anxiety to improve student academic performance. It recommends the enhancement and contextualization of psychological programs in teaching science to offer emotional support to learners. Future research should explore qualitative research that examines the elements influencing a learner's positive attitude towards science, as well as those that contribute to science-related anxiety.
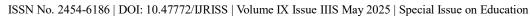
Keywords: multiple regression, positive attitude, psychological factors

INTRODUCTION

Science education in the Philippines has evolved significantly since the 2012 K–12 curriculum, employing spiral progression to sequence competencies in life and earth sciences, biology, chemistry, and physics by increasing complexity (Tirol, 2021). Despite this, Filipino students continue to underperform in mathematics and science, ranking among the lowest globally in the 2022 PISA, with no improvement since 2018 (Chi, 2023). In contrast, Singapore's inquiry-based curriculum and rigorous teacher training have produced a PISA science score of 561, over 200 points above the Philippines, while Finland's equitable, low-test-pressure system fosters high achievement and well-being (OECD, 2023; Sahlberg, 2021). Locally, the Division of Panabo City monitors quarterly Mean Percentage Scores (M.P.S.) for K–12 subjects, revealing persistently low science results. Psychological factors including students' science attitudes and science anxiety are known to affect performance (Osborne et al., 2015; Mallow, 2018; Udo et al., 2020; Kuhl et al., 2019). Positive attitudes foster deeper learning and sustained interest (Adesoji et al., 2019), whereas science anxiety undermines engagement and achievement (Chiu et al., 2015). Considering the relationship of science attitude, science anxiety and academic performance in science, the study was conducted to investigate how science attitude and science anxiety concurrently influence Grade 10 students' academic performance, with implications for targeted interventions.

LITERATURE REVIEW

1) Science Attitude: It refers to the feelings, beliefs, and values individuals hold about science and its role in society. It plays a crucial role in students' engagement with science, influencing their motivation, interest, and

academic performance (Osborne, 2015; Syukur, 2016). Positive attitudes toward science can enhance enthusiasm, self-esteem, and create an atmosphere conducive to learning (Syukur, 2016). Students' attitudes are shaped by factors like their level of interest, motivation, prior experiences, and perceptions of the subject's relevance (Osborne et al., 2015).

Moreover, students who view science as an engaging and valuable subject tend to perform better academically (Mao et al., 2021), though cognitive abilities, teaching methods, and learning environments also play significant roles (Mao et al., 2021). In addition, the learning environment, particularly the science laboratory, is pivotal in shaping students' attitudes toward science (Chua et al., 2017). Despite its importance, a decline in positive attitudes toward science has been observed as students transition from primary to secondary school, which may affect future academic choices (Naganuma, 2023). Factors such as critical thinking, curiosity, and confidence, often driven by supportive teaching methods, are key to fostering a keen interest in science (Gitatenia & Lasmawan, 2022; Caena & Stringher, 2020).

2) Science Anxiety: It refers to the negative emotional reactions individuals experience when learning or teaching science, affecting their academic performance and preferences for the subject. It is distinct from general anxiety, focusing specifically on difficulties in understanding scientific concepts and engaging in science-related activities (Megreya et al., 2021). There are two primary types of science anxiety: learning science anxiety, which involves discomfort with science concepts or tasks, and science evaluation anxiety, which relates to stress during assessments (Megreya et al., 2021). Both can hinder academic performance, but managing them may require different strategies.

In addition, the impact of science anxiety on cognition and decision-making is complex. While anxiety generally impairs concentration and engagement (Oludipe et al., 2019), research suggests that a moderate level of anxiety may not always be harmful. Kaur et al. (2020) found a low positive correlation between anxiety and performance, indicating that anxiety could serve as a motivational factor, helping students to focus and potentially improve their performance.

Moreover, personal and environmental factors significantly shape science anxiety. Studies have shown that parental involvement and socioeconomic status play a key role in students' anxiety levels, with active parental support and access to resources reducing anxiety and promoting a more positive learning experience (Mendez et al., 2023). In modern educational contexts, learning environments, especially in remote settings, also play a significant role. Limited face-to-face interactions can heighten feelings of isolation and stress (Degorio et al., 2023). Furthermore, factors such as family income and school type also influence anxiety, with students from higher-income families experiencing less anxiety due to better support systems (Özbuğutu, 2021).

3) Academic Performance: Academic Performance is a complex construct that goes beyond just grades and test scores, incorporating a variety of psychosocial factors that contribute to student success, particularly in higher education (Tindle et al., 2022). Grades and GPA are the most commonly used indicators of academic success, reflecting a student's ability to meet specific academic standards (York et al., 2015).

In the context of science education in the Philippines, several studies have examined the role of psychological factors in academic performance. Self-efficacy is particularly important in shaping science performance among junior high school students, with students who believe in their ability to succeed performing better in science (Digal & Walag, 2019). Other factors such as self-esteem and help-seeking behavior also positively influence academic success. Students with high self-esteem and self-efficacy approach challenges with confidence, which enhances their academic performance. Moreover, students who seek help when needed are more likely to improve their academic outcomes (Alipio, 2020).

Theoretical and Conceptual Framework of the Study

This study was grounded in Walberg's Theory of Educational Productivity, which offers a comprehensive understanding of the factors influencing academic performance. Walberg's model emphasizes the interplay between three key components: student characteristics, instructional quality, and the learning environment. These elements collectively shape learning outcomes. In the context of this study, science attitude and science anxiety are identified as critical student characteristics that significantly affect the academic performance of Grade 10 learners in science.

Building on Walberg's Theory, the conceptual framework of this study further explores the relationships between science attitude, science anxiety, and academic performance in science. In this framework, science attitude and anxiety are conceptualized as independent variables, while academic performance serves as the dependent variable.

METHODOLOGY

This study employed a quantitative correlational research design to examine the relationships between science attitude, science anxiety, and academic performance among Grade 10 students in the Division of Panabo City. The choice of this design aligns with Creswell et al. (2018), emphasizing the use of statistical tools to determine the strength and direction of relationships among variables. Furthermore, multiple linear regression analysis was applied to determine the influence of science attitude and science anxiety on students' academic performance in science.

A cluster sampling technique was used to select participants from three major secondary schools in the Panabo City Division; School A, School B and School C. From the total population of 3,416 Grade 10 students, a representative sample of 346 students was drawn, with each school contributing 116 respondents, ensuring equitable representation through simple random sampling.

To measure the study variables, the researcher used standardized and validated questionnaires adapted from existing literature. The science attitude questionnaire developed by Zubair and Mahmood (2011) contained 23 items across four subscales; keenness to learn, enjoyment in science learning, interest, and teacher interaction and was rated on a five-point Likert scale. The science anxiety scale, adapted from Güzeller and Doru (2012), included 25 items divided into personal and environmental subscales. Both instruments were pilot-tested and demonstrated strong reliability, with Cronbach's Alpha values exceeding 0.70 for science attitude and 0.90 for science anxiety.

On the other hand, the dependent variable, academic performance, was assessed through the average of the first and second quarter science grades, interpreted using the descriptors from DepEd Order No. 8, s. 2015. Grades were categorized from Outstanding to Did Not Meet Expectations, allowing for a standardized evaluation of academic outcomes.

The study employed statistical analysis including mean scores to determine the levels of science attitude, science anxiety, and academic performance. Pearson's r to assess the correlation between science attitude and academic performance and science anxiety and academic performance Lastly, multiple linear regression to determine the influence of science attitude and science anxiety on academic performance.

Overall, the research design and methodology were structured to ensure validity, reliability, and ethical integrity, providing a sound basis for understanding the psychological factors influencing science achievement among secondary school students in Panabo City.

RESULTS AND DISCUSSION

Table 1 Summary of the Grade 10 Level of Science Attitude

Indicators	Standard deviation	Mean	Descriptive Equivalent
Keenness to Learn	1.00	3.44	High
Enjoyment in science learning	0.99	3.53	High
Interest	0.97	3.42	High
Teacher Int eraction	1.09	3.49	High

Over-all result	1.01	3.49	**High**

Table 1 presents the findings of the level of attitude among Grade 10 learners of Panabo City Division towards learning science. The findings reveal that Grade 10 learners generally hold a positive attitude toward science, with an overall mean score of 3.49—interpreted as High. Among the four subscales, enjoyment in science learning ranked highest (M = 3.53), followed by teacher interaction (M = 3.49), keenness to learn (M = 3.44), and interest (M = 3.42). These results indicate that students find science enjoyable, value their interactions with teachers, and are motivated to learn and stay curious about the subject. Standard deviation values suggest consistent responses, although slight variability was noted in teacher interaction, reflecting diverse experiences with educators. These results support existing literature, including Mao (2021) and Tenzin et al. (2018), which link positive science attitudes to improved academic performance and highlight the importance of engaging teaching strategies and strong student-teacher interaction.

Table 2 Summary of the Grade 10 Level of Science Anxiety

Indicators	Standard deviation	Mean	Descriptive Equivalent
Personal	1.15	2.55	Low
Environmental	1.15	2.56	Low
Over-all result	1.15	2.55	**Low**

Table 2 presents the findings of the level of anxiety among Grade 10 Learners of Panabo City Division towards learning science. It revealed that Grade 10 learners exhibited a low level of science anxiety, as reflected by an overall mean score of 2.55. Both personal (M = 2.55) and environmental (M = 2.56) factors also fell within the Low descriptive range, indicating minimal fear or discomfort related to science learning. A standard deviation of 1.15 across indicators suggests a moderate spread in responses, but the consistency around the mean confirms that science anxiety remains generally low among the students. These findings align with prior studies, such as Ucak (2019) and Caymaz (2021), which reported that secondary students tend to experience low science anxiety, especially when supported by strong academic performance and positive learning experiences. Furthermore, Degorio et al. (2023) emphasized the impact of the learning environment on anxiety level as a factor that in this study also showed low levels of influence, reinforcing the importance of supportive classroom conditions.

Table 3 Level of Grade 10 Student's Academic Performance in Science in terms of Grades

Indicators	Standard deviation	Mean	Descriptive Equivalent
Academic Performance	5.19	84.02	Satisfactory

Table 3 presents the findings of the level of academic performance among Grade 10 learners of Panabo City Division. The academic performance of Grade 10 students in the Panabo City Division was assessed using their first and second quarter grades. The computed mean score was 84.02 with a standard deviation of 5.19, which, based on DepEd Order No. 8, s. 2015, corresponds to a "Satisfactory" level of performance. This indicates that students are performing at an approaching proficient level, demonstrating a basic understanding of science concepts and achieving grades that are generally aligned with the average of their peers. The moderate standard deviation suggests some variation in individual performance but shows that most students cluster near the mean. These findings are in line with the study of Ramirez (2022), which found that students often begin the school year at a satisfactory level and show progress over time. Similarly, Digal (2019) noted that junior high school students' science performance commonly falls within the satisfactory range, where science attitude and self-efficacy play a key role in influencing academic achievement.

Table 4 Relationship between Science Attitude and Science Anxiety in the Academic Performance of Grade 10 Learners

Variables	Correlation Coefficient	*p-value*	Decision
Science Attitude and Academic Performance	.358**	.000	Reject
Science Anxiety and Academic Performance	-.305**	.000	Reject

The results presented in Table 4 show significant relationships between the independent variables: science attitude and science anxiety and the dependent variable, academic performance. A moderate positive correlation ($r = .358$, $p < .001$) was found between science attitude and academic performance. This implies that students with a more favorable attitude toward science tend to perform better academically. The result is statistically significant, supporting the rejection of the null hypothesis and emphasizing the positive impact of attitude on science achievement. Conversely, science anxiety demonstrated a moderate negative correlation ($r = -.305$, $p < .001$) with academic performance. This indicates that higher levels of science anxiety are associated with lower academic achievement, and this relationship is also statistically significant. These findings affirm the role of positive science attitudes in promoting academic success, echoing the results of Mao et al. (2021), who found a comparable positive correlation in their meta-analysis. Similarly, Darlo et al. (2022) emphasized that a strong science attitude supports science literacy and engagement, which translates to better academic outcomes. In contrast, the negative impact of science anxiety on performance supports the work of Weda et al. (2018), who reported that increased anxiety significantly reduces academic performance. The results confirm that reducing science anxiety is crucial to improving students' learning experiences and achievements in the subject.

Table 5 Regression Analysis on the Effect of Science Attitude and Science Anxiety on the Academic Performance of Grade 10 Learners

Model	Model	B	SE	Beta	t-ratio	Sig.
1	(Constant)	78.522	2.205		35.607	.000
	Science Attitude	2.935	.484	.300	6.061	.000
	Science Anxiety	-1.871	.405	-.229	-4.624	.000
R =.421	R^2 = 0.177	R^2 = 0.173		F = 38.692	p-value = 0.000	

Table 5 presents the results of the multiple regression analysis conducted to determine the extent to which science attitude and science anxiety predict the academic performance of Grade 10 students. The regression model was found to be statistically significant, $F_{(2, N)} = 38.692$, $p < .001$, indicating that the two predictors collectively have a significant effect on students' academic achievement. The R-value of 0.421 signifies a moderate correlation between the predictors and academic performance, while the R² value of 0.177 reveals that approximately 17.7% of the variance in students' science grades can be explained by their attitude and anxiety levels.

In terms of individual predictors, science attitude had a positive and significant effect on academic performance ($B = 2.935$, $t = 6.061$, $p < .001$). This indicates that a more positive attitude towards science leads to higher academic achievement. Meanwhile, science anxiety had a significant negative effect ($B = -1.871$, $t = -4.624$, $p < .001$), confirming that increased anxiety negatively impacts performance.

The standardized coefficients further show that science attitude ($\beta = .300$) had a greater influence on academic performance than science anxiety ($\beta = -.229$).

Table 6 Final Regression Model

$Y = 78.522+2.935X_1-1.871X_2$		
Where		
	X_1	Science Attitude
	X_2	Science Anxiety

In the final regression model, Y represents the predicted academic performance of Grade 10 learners, with X_1 denoting science attitude and X_2 representing science anxiety. The model confirms that both predictors significantly influence students' academic outcomes in science. The coefficient for science attitude (B = 2.935) indicates that for every one-unit increase in a learner's positive attitude toward science, academic performance is expected to increase by approximately 2.935 points, assuming science anxiety remains constant. This suggests that fostering a positive attitude toward the subject can lead to meaningful improvements in academic outcomes.

Conversely, the coefficient for science anxiety (B = -1.871) reveals that a one-unit increase in science anxiety is associated with an estimated 1.871-point decrease in academic performance, assuming a constant level of science attitude. This highlights the detrimental effect of anxiety on student achievement in science.

The model's intercept (78.522) reflects the predicted academic performance when both science attitude and science anxiety are zero. Although such a scenario is unlikely in practice, the intercept serves as a baseline reference for the regression equation. These findings emphasize the significant role of psychological factors in shaping learners' academic success. A positive science attitude contributes to improved academic performance, while science anxiety poses a barrier to achievement.

Limitations of the Study

While this study provides valuable insights into the relationship between science attitude, science anxiety, and academic performance, several limitations must be acknowledged. First, the study employed a cross-sectional design, which restricts the ability to infer causal relationships among variables. Second, the data were collected from only three schools within the Division of Panabo City, which may limit the generalizability of the findings to other contexts or regions. Third, although validated instruments were used, self-reported data may be subject to response bias. Future research could benefit from longitudinal designs, broader sampling across diverse contexts, and mixed-method approaches to deepen the understanding of these psychological constructs.

CONCLUSIONS

This study examined the academic performance of Grade 10 students in the Division of Panabo City, focusing on their attitudes towards science and levels of science anxiety. The results indicated that students typically exhibit a positive disposition towards science; substantial teacher engagement and high levels of satisfaction in science education appear to be the primary factors influencing this attitude. The findings underscore the importance of fostering engagement and involvement in the subject, along with the crucial role educators have in shaping their students' perspectives. Additionally, students exhibited minimal levels of science anxiety; both external and personal sources of concern consistently had a negligible effect. This suggests that when addressing issues related to science, students exhibit a notable level of confidence and emotional resilience. Students demonstrated satisfactory academic performance, indicating a basic yet steady understanding of scientific concepts.

The study revealed a statistically significant positive correlation between attitudes towards science and academic performance, indicating that students with more favorable views on science tend to achieve higher academic success. Conversely, a slight negative correlation between anxiety related to science and academic success highlighted how increasing concerns could hinder students' performance in their studies. The regression analysis validated these connections by demonstrating that both science attitude and science anxiety serve as significant factors in determining academic achievement.

The study's results provide robust support for Walberg's Theory of Educational Productivity, emphasizing the importance of student psychological characteristics in influencing learning outcomes. Walberg's model posits that academic achievement is determined by the interplay of student aptitude, instructional quality, and the learning environment. The findings of this study indicate that science attitude and science anxiety are essential components of student aptitude that directly influence science performance. Additionally, instructional quality, specifically teacher interaction, was identified as a significant sub-factor in the science attitude scale. This indicates that students who view their science teachers as supportive and engaging experience heightened motivation and confidence. The learning environment mediates science anxiety; the low anxiety levels observed in this study may indicate the presence of emotionally supportive and structured classrooms. This interaction of emotional, instructional, and environmental factors aligns with Walberg's framework for optimal conditions conducive to academic achievement.

Consequently, the findings of this study suggest that both emotional and cognitive dimensions must be simultaneously considered in science education. The academic performance of students who experience joy, engagement, and support from their teachers tends to be robust. Addressing and resolving the sources of anxiety related to scientific pursuits will ensure that students are not hindered by unease or apprehension. Therefore, educational interventions should focus on developing emotionally supportive classrooms, encouraging curiosity, and promoting resilience.

The findings present a significant opportunity for individuals engaged in education. It is recommended that the Division of Panabo City develop and implement targeted interventions, including teacher training programs focus on socio-emotional learning and classroom anxiety management, enabling educators to identify and address students' emotional needs. Workshops aimed at reducing science anxiety for students, incorporating mindfulness practices, enhancement of study skills, and the establishment of peer support groups. Science enrichment programs, such as inquiry-based learning modules, science clubs, and inter-school science fairs, foster enjoyment and mitigate anxiety related to the subject of science. The Kumustahan Program should be expanded to systematically monitor and support students demonstrating high anxiety or low engagement in science. These interventions will foster a supportive science education environment that aligns with cognitive and emotional development. Professional development should empower educators to create engaging learning environments and strengthen student-teacher relationships. Moreover, ongoing assessment of students' attitudes and anxiety levels can help identify individuals requiring early intervention, especially among children aiming for science pathways in senior high school.
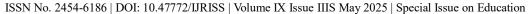
Future research should employ mixed-method research designs that integrate quantitative surveys with qualitative approaches, including interviews or focus group discussions. This method offers a thorough understanding of the factors affecting science attitudes and anxiety by integrating statistical trends with personal insights. Furthermore, it is advisable to conduct longitudinal studies that track students across various grade levels to investigate the development of these psychological variables over time and evaluate the enduring effects of interventions on academic performance in science. These methodologies provide enhanced insights and inform the formulation of more effective educational strategies and policies.
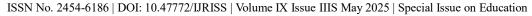
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